The influence of socio-economic and locational disadvantage on survival after a diagnosis of lung or breast cancer in Western Australia

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***Objective*: The effects of demographic, locational and socio-economic disadvantage, and the influence of private health care on five-year mortality rates in patients with lung cancer or after breast cancer surgery in Western Australia were examined.**

***Methods*: The Western Australian Record Linkage Project was used to extract all hospital morbidity, cancer and death records of all people with lung or breast cancer in Western Australia from 1982 to 1996. Mortality rate ratios after a diagnosis of lung cancer or breast cancer surgery were estimated using Cox regression. Two sets of analyses were carried out: demographically adjusted from 1982 to 1996; and demographically and disadvantage adjusted from 1992 to 1996.**

***Results*: Overall, 87.7% of lung cancer and 17.8% of breast cancer patients were deceased by five years. Lung and breast cancer patients treated in rural hospitals had higher mortality rates (1992–1996: relative risk (RR) 1.24, 95% confidence interval (CI) 1.07–1.44, and RR 1.20, 95% CI 0.92–1.56, respectively; 1982–1996: RR 1.20, 95% CI 1.11–1.30, and RR 1.19, 95% CI 1.06–1.33, respectively), whereas location of residence had little effect. Lung and breast cancer patients treated in private hospitals had lower mortality (1992–1996: RR 0.85, 95% CI 0.76–0.95, and RR 0.90, 95% CI 0.77–1.05, respectively; 1982–1996: RR 0.91, 95% CI 0.84–0.97, and RR 0.92, 95% CI 0.85–0.99, respectively), although insurance status was not a factor. Women with breast cancer had significantly worse survival in the more socio-economically disadvantaged groups (1992–1996: RR 1.41 to 1.26; 1982–1996: RR 1.45 to 1.29).**

***Conclusions*: Survival was poorer in patients treated in the public hospital system, but the possession of private health insurance was not predictive of better outcomes. People treated in rural hospitals had worse survival, whereas location of residence was not an independent factor. Women in more socio-economically advantaged groups who underwent breast cancer surgery had improved survival.**

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Introduction

The development of linked population-based datasets have provided researchers with powerful tools to evaluate the quality and effectiveness of health services and inequalities within the health system.[1] In 1995, the Western Australian Data Linkage Project was established, with the ability to link together all hospital morbidity data, cancer registrations and death registrations across the entire state. Since 1970, records of all public and private hospital admissions have been captured.[2]

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Australia has a universal publicly funded system of health care (Medicare) in tandem with a private health system. The private system is funded through individual payments with community risk pooling. Since the 1960s there have also been tax subsidies to the private health insurance industry, and in 1999 tax incentives for people to take out private health cover with 30% rebates on premiums were introduced. Medicare also contributes to the cost of care within the private sector. Patients with private health cover can choose to access private or public hospitals; those without cover incur out-of-pocket costs if they wish to enter the private system.[3] Commentators have said that this has led to a two-tier system for the rich and the poor, with implications for treatment patterns and survival in economically disadvantaged groups.[4] Further to concerns of socio-economic disadvantage are those related to location. Western Australia (WA) is a large state spanning over a million square miles. Perth, the capital city has approximately 1.4 million residents, with the remaining half million WA

residents being spread around the state, mainly in the five regional centres between 2 and 14 hours' drive from Perth. Distance is therefore a major barrier in accessing health services, and, although there are schemes to assist some patients with travel costs, the time and economic costs of locational disadvantage remain substantial.

Survival after a diagnosis of lung cancer is poor, with only 10–15% of patients with non-small cell lung cancer, comprising adenocarcinoma (including bronchoalveolar carcinoma), adenosquamous, squamous and large cell types, surviving five years or longer.[5–10] In patients with small cell lung cancer, the five-year survival is only 1–5%.[5,6] Frequently, lung cancer patients present late, with many already having lymph-node involvement and metastatic spread;[7] thus the opportunity for curative treatment has often passed and palliation is the objective of clinical management.

The five-year survival after a diagnosis of breast cancer is better at 65%[11] to 81%;[12] the annual case fatality declining by an average of 1.9% per annum during the 1990s,[13] with younger women aged 25–49 years experiencing a greater reduction at 4.2%.[14] In part, this is due to early detection with mammographic screening and to advancements in treatment, in particular the development of adjuvant therapy.[11] In Australia, little work on factors of disadvantage that affect these survival outcomes has been carried out.

This study used the Western Australian Record Linkage Project to examine factors affecting the mortality experience of lung cancer and breast cancer surgery patients in Western Australia. Specifically, we investigated the effects of socio-economic and locational disadvantage, the possession of private health insurance and access to private hospital care.

Patients and methods

Linked data

The Western Australian Record Linkage Project was used to extract all state cancer registrations, death records and hospital morbidity records of all residents of Western Australia who met the selection criteria. The sources were state population-based registries. A chain of records was formed for each patient, consisting of rows of hospital admission abstracts to which were appended the cancer and death registry information. The first row with a mention of the cancer of interest – lung or breast – was termed the index admission. This row provided demographic data plus hospital and private health insurance status and whether the hospital was metropolitan or rural. In addition, it and any admissions in the previous 365 days provided the Charlson comorbidity index, used to adjust for the effects of comorbidity in the Cox regression analyses.[15] This index was devised from 17 groups of ICD codes weighted according to mortality risk (lung neoplasms for the lung cancer cases and breast neoplasms for the breast cancer cases were excluded); the total weighted index was divided into three intervals.

Case selection and cancer information

A lung cancer case was defined as a person with a diagnosis of primary invasive lung cancer (ICD-9 162 and ICD-10-AM C33 and C34)[13,16–18] in the cancer registry or, in cases with no cancer registration, a person who had a primary lung cancer diagnosis on their hospital separation discharge record together with a death registration of lung cancer. Only patients with a date of first diagnosis in the cancer registry from 1 January 1982 to 31 December 1996 were included; patients with only a hospital morbidity data system and death record had the earliest date in the hospital morbidity record with a mention of lung cancer used instead.[19] Lung cancer surgery was defined as one or more of pneumonectomy, lobectomy, segmentectomy, wedge resection or excision/resection of the bronchus, trachea or endotrachea. The histology was categorised according to the cancer registry information as adenocarcinoma, adenosquamous, squamous and large-cell or small-cell carcinoma. Lung cancers that did not fall into these categories (e.g. sarcomas, malignant neoplasms not otherwise specified, and carcinoma not otherwise specified) were termed 'other malignancy'. Analyses carried out with and without this group found the coefficients and their significance in the Cox regression models to be very similar; they have therefore been included in the results.

The breast cancer cases were defined as any female with a hospital separation record with a surgical procedure for breast cancer and a diagnosis of breast cancer in the cancer registry or, in cases with no cancer registration, a mention of breast cancer in their hospital separation record (ICD-9 174 and ICD-10-AM C50).[13,16–18] Patients with a date of diagnosis in the Cancer Registry between 1 January 1982 and 31 December 1996 were included in the study. A binary variable that distinguished breast-conserving surgery from mastectomy was created and used to adjust for confounding in the analysis.

Assignment of indices of disadvantage

To examine the effect of socio-economic disadvantage on mortality each index row was assigned an Index of Relative Socio-economic Disadvantage (IRSD) from Western Australian collection district census data for 1991 and 1996. A collection district consisted of approximately 200 households. Based on household and individual attributes, the IRSD had five categories dividing the population into quartiles of disadvantage with the lowest quartile subdivided into those above and those below the tenth percentile of most disadvantaged.[20] Likewise, the Accessibility/Remoteness Index of Australia (ARIA) was assigned to each collection district to determine the effects of place of residence on survival. The postcode was used if the collection district was unavailable. Analysis using IRSD or ARIA codes was restricted to admissions occurring after 1 January 1991, when collection districts first became available via residential address mapping.

Five-year mortality analysis

χ^2 analyses followed by Cox regression analyses of the rate of death after a diagnosis of lung cancer or after surgery for breast cancer were carried out. To allow for five years of follow-up only cases identified before 1997 were included in the analysis. Proportional hazards assumptions were checked before proceeding with the analyses. The Box–Tidwell transformation [age × ln(age)] was placed in the regression models with a continuous age covariate to improve model fit for age-adjustment purposes.[21] The analysis was performed in SPSS for Windows version 10.0.7. Ethical approval for the study was granted by the Human Research Ethics Committee of the University of Western Australia.

Results

Of the 9080 cases of lung cancer, 7964 (87.7%) were deceased by five years; of these, the underlying cause of death was lung cancer in 88.3%. Only 71 cases did not have a cancer registration and relied on hospital and death registration information. There were 7117 women who underwent surgery for breast cancer. At five years after surgery, 17.8% of the women were deceased, with just over one half of these (52%) having breast cancer registered as the underlying cause of death.

The bivariate analyses revealed that being younger, having less comorbidity, or being married were significant predictors of survival for both lung and breast cancer at five years (Table 1). Lung cancer cases who were female, diagnosed in more recent times, underwent surgery or had adenocarcinoma also did better. Women who had breast-conserving surgery, especially more recently, did better than those who underwent mastectomy, as expected given a likely more favourable stage distribution in those who avoided mastectomy. For both lung and breast cancer, patients with private insurance or who went into a private hospital had better survival. Women from the more advantaged groups and those resident in more accessible areas or who underwent surgery in metropolitan hospitals had improved survival after their breast cancer surgery (Table 1).

Cox regression analyses of the rates of death within five years of follow-up confirmed that mortality was reduced in younger cases and those with less comorbidity (Table 2). Lung cancer cases who were diagnosed in more recent times, underwent surgery, had adeno- or squamous cell carcinoma or who were female also experienced less mortality. Women who had breast-conserving surgery also did significantly better. Although private health insurance was not a significant indicator of survival from either cancer, being treated in a private hospital was. Care in a metropolitan hospital significantly reduced mortality in both lung and breast cancer patients. Additional analyses found no evidence of an interaction between the year of diagnosis and being treated in a rural or private hospital ($P > 0.2$). Although residential area was not a significant predictor of survival outcome, women resident in moderately accessible or remote areas tended to do worse, but this information was imprecise because of the small numbers. Women in the least disadvantaged socio-economic group did much better than those in the disadvantaged groups after their breast cancer surgery. Although the relative risk of death was raised similarly in the lung cancer cases this generally did not reach significance (Table 2). The four models reported in Table 2 all have a significant overall *P*-value for all of the factors ($P < 0.001$).

In an attempt to determine the impact of cancer stage, additional adjusted Cox regression analyses were carried out. The assumption was made that people undergoing lung cancer surgery had stage I or II cancer and that this group should, in regard to stage, be more homogeneous than the whole cohort. The numbers were small and imprecise; however, they did show patterns of relative risk similar to the whole group. In a similar analysis for women having breast-conserving surgery, again assuming that these women would be a more homogeneous group with respect to stage, a comparable pattern of relative risk was seen.

Discussion

This study is unique in examining the influence of a number of dimensions of social, economic and locational disadvantage on lung and breast cancer case fatality within a large population-based cohort. We found that people with lung cancer and women after breast cancer surgery had poorer outcomes if they were first admitted to a rural hospital, but, beyond this, location of residence was not a predictive factor. Likewise, people admitted to a private hospital had better outcomes, whereas possession of private health insurance had little effect. The socio-economic status of the patient had little influence on outcome in lung cancer patients but had a strong effect in breast cancer surgery patients.

A plausible reason why first admission to a rural hospital may lead to less likelihood of survival is that these patients could present with more advanced cancers, which are less amenable to treatment. At the time of this study, the Cancer Registry did not record cancer staging information. The relationship between stage of lung cancer at diagnosis and location is unclear, with some studies having shown that distance to hospital matters but not residential location,[22] whereas others have shown that residential location and advanced stage were related.[23–25] There is little evidence that rural women in Australia present with more advanced breast cancers. The state public breast-screening programme has found that rural women attend mammography screening more frequently than metropolitan women.[26] In rural Victoria, there was no evidence that women were presenting with more advanced tumours than women in metropolitan areas.[27] Despite the lack of evidence that people with lung or breast cancer from rural areas present with more advanced cancers, this

Table 1 Characteristics of lung and breast cancer patients in Western Australia in 1982–2001, showing proportions of those who were deceased at five years

		Lung cancer			Breast cancer		
		Total per category: *n* (%)	**Deceased (%)**	**χ^2 *P*-value**	**Total per category: *n* (%)**	**Deceased (%)**	**χ^2 *P*-value**
Calendar year of lung cancer diagnosis or breast cancer surgery							
1982–1986		2615 (28.8)	86.9		2021 (28.4)	26.9	
1987–1991		3123 (34.4)	86.9	<0.01	2366 (33.2)	23.2	<0.01
1992–1996		3342 (36.8)	89.1		2730 (38.4)	17.1	
Age at admission (years)							
Age <60		1920 (21.1)	84.0	<0.01	3860 (54.3)	18.3	<0.01
Age >60		7159 (78.9)	88.7		3255 (45.7)	26.3	
Gender							
Male		6483 (71.4)	88.3	<0.01	N/A		
Female		2597 (28.6)	86.1				
Charlson weighted comorbidity index							
0		4839 (53.3)	82.1		5468(76.8)	18.2	
1–2		1099 (12.1)	89.4	<0.01	396 (5.6)	31.8	<0.01
3–14		3142 (34.6)	95.7		1253 (17.6)	35.1	
Marital status							
Never married		588 (7.4)	88.3		396 (5.6)	25.5	
Married/de facto		5848 (63.8)	86.9		4735 (66.5)	19.2	
Divorced/separated		699 (7.7)	88.3	0.02	484 (63.0)	20.5	<0.01
Widowed		1678 (18.9)	89.9		1393 (19.6)	30.0	
Unknown		168 (2.1)	88.9		109 (1.5)	29.4	
Indigenous status							
Non-indigenous		8890 (97.9)	98.0	0.14	6994 (98.6)	21.9	0.02
Indigenous		190 (2.1)	84.2		98 (1.4)	12.2	
Surgery status (lung cancer yes = surgery; breast cancer yes = breast-conserving surgery)							
No		7977 (87.9)	91.9	<0.01	4461 (62.7)	25.1	<0.01
Yes		1103 (12.1)	57.1		2656 (37.3)	16.6	
Histology of lung cancer							
Adenocarcinoma		2242 (24.7)	83.9				
Small cell		1380 (15.2)	94.4				
Large cell		988 (10.9)	91.7	<0.01	N/A		
Squamous		2468 (27.2)	87.5				
Other malignancy		1715 (22.0)	85.7				
Index of Relative Socio-economic Disadvantage (IRSD)							
Least disadvantaged	1	702 (17.0)	87.7		934 (28.8)	12.6	
	2	811 (19.7)	86.4		732 (22.6)	19.0	
	3	1267 (30.8)	86.0	0.27	900 (27.7)	17.7	<0.01
	4	820 (19.9)	87.7		444 (13.7)	22.7	
Most disadvantaged	5	518 (12.6)	89.6		234 (7.2)	20.5	
Insurance status							
Public		6196 (69.1)	88.9	<0.01	3448 (48.4)	25.3	<0.01
Private		2771 (30.9)	85.6		3669 (51.6)	51.6	
Hospital type							
Public		7990 (88.0)	88.1	<0.01	4055 (57.0)	25.0	<0.01
Private		1090 (12.0)	85.0		3062 (43.0)	17.9	
Accessibility/Remoteness Index of Australia (ARIA)							
Very accessible		3482 (84.7)	87.0		2762 (85.0)	16.9	
Accessible		272 (6.6)	84.9		219 (6.7)	16.0	
Moderate accessible		222 (5.4)	91.4	0.06	168 (5.2)	25.6	0.05
Remote		95 (2.3)	92.6		47 (1.4)	17.0	
Very remote		42 (1.0)	81.0		54 (1.7)	22.2	
Location of hospital where first admitted							
Metropolitan		8249 (91.0)	87.6	0.33	6240 (87.7)	21.6	0.04
Rural		814 (9.0)	88.8		877 (12.3)	24.6	

cannot be completely ruled out. The small effects of rural and private health care could conceivably be artefacts of residual confounding caused by later presentation; but this would have implications for the accessibility of health services rather than their differences in effectiveness. The inferences that can be made from the results and the policy implications, therefore, must be drawn cautiously.

In Australia, little work on the influence of private health insurance or access to private hospital care on

Table 2 Cox regression analysis of death rates from any cause during the five years after a diagnosis of lung cancer or after surgery for breast cancer according to demographic, socio-economic and locational disadvantage

Factor		Lung cancer		Breast cancer	
		1982–2001	1991–2001	1982–2000	1991–2000
		Adjusted relative risk[a] (95% CI)	Adjusted relative risk[b] (95% CI)	Adjusted relative risk[a] (95% CI)	Adjusted relative risk[b] (95% CI)
Calendar year of diagnosis					
1982–1986		1.00	N/A	1.00	N/A
1987–1991		0.93 (0.88–0.99)	1.00	0.69 (0.64–0.76)	1.00
1992–1996		0.92 (0.91–0.97)	0.98 (0.89–1.07)	0.35 (0.32–0.39)	0.72 (0.60–0.86)
Age at admission (per year)		1 (1.01–1.02)	1.01 (1.01–1.02)	1.03 (1.03–1.04)	1.03 (1.02–1.03)
Gender (female)		0.89 (0.85–0.94)	0.89 (0.82–0.96)	N/A	
Charlson weighted comorbidity index					
0		1.00	1.00	1.00	1.00
1–2		1.05 (0.98–1.14)	1.06 (0.96–1.18)	1.46 (1.26–1.70)	1.53 (1.17–1.99)
3–14		1.76 (1.67–1.85)	1.83 (1.70–1.98)	1.92 (1.75–2.11)	2.23 (1.90–2.61)
Marital status					
Never married		1.00	1.00	1.00	1.00
Married/de facto		0.91 (0.84–0.99)	0.96 (0.83–1.10)	0.86 (0.72–1.02)	0.80 (0.58–1.11)
Divorced/separated		0.98 (0.87–1.01)	0.93 (0.77–1.10)	0.95 (0.76–1.18)	0.85 (0.57–1.27)
Widowed		0.95 (0.87–1.05)	0.95 (0.81–1.11)	0.86 (0.72–1.01)	0.70 (0.52–0.95)
Unknown		0.99 (0.84–1.18)	0.96 (0.76–1.21)	1.26 (0.88–1.78)	1.03 (0.65–1.64)
Indigenous status (yes)		0.99 (0.85–1.16)	0.94 (0.73–1.21)	0.86 (0.61–1.22)	1.05 (0.57–1.92)
Surgery status (lung cancer yes = surgery; breast cancer yes = breast-conserving surgery)		0.32 (0.30–0.35)	0.31 (0.28–0.36)	0.78 (0.71–0.86)	0.73 (0.63–0.84)
Histology of carcinoma					
Adenocarcinoma		1.00	1.00	N/A	
Small cell		1.09 (1.02–1.18)	1.07 (0.96–1.20)		
Large cell		1.20 (1.11–1.30)	1.23 (1.11–1.38)		
Squamous		0.96 (0.90–1.01)	0.94 (0.85–1.03)		
Other malignancy		1.18 (1.10–1.26)	1.14 (1.03–1.27)		
Index of Relative Socio-economic Disadvantage (IRSD) 1991–2001 only					
Least disadvantaged	1	1.00	1.00	1.00	1.00
	2	1.05 (0.94–1.17)	1.03 (0.92–1.16)	1.45 (1.18–1.79)	1.41 (1.14–1.74)
	3	1.11 (1.00–1.22)	1.09 (0.98–1.20)	1.24 (1.01–1.53)	1.18 (0.95–1.46)
	4	1.03 (0.92–1.14)	1.03 (0.92–1.15)	1.40 (1.10–1.76)	1.34 (1.05–1.70)
Most disadvantaged	5	1.07 (0.94–1.20)	1.05 (0.93–1.20)	1.29 (0.96–1.73)	1.26 (0.93–1.69)
Insurance status (private)		0.92 (0.81–0.97)	1.06 (0.96–1.17)	0.94 (0.87–1.02)	0.97 (0.71–1.33)
Hospital status (private)		0.91 (0.84–0.97)	0.85 (0.76–0.95)	0.92 (0.85–0.99)	0.90 (0.77–1.05)
Accessibility/Remoteness Index of Australia (ARIA) 1991–2001 only					
Very accessible		1.00	1.00	1.00	1.00
Accessible		1.08 (0.94–1.23)	0.97 (0.84–1.13)	0.97 (0.72–1.31)	0.85 (0.61–1.19)
Moderate accessible		1.13 (0.99–1.31)	1.01 (0.86–1.19)	1.42 (1.05–1.90)	1.26 (0.91–1.75)
Remote		1.00 (0.80–1.24)	0.94 (0.75–1.18)	1.33 (0.70–2.50)	1.21 (0.64–2.28)
Very remote		0.94 (0.65–1.35)	0.84 (0.58–1.22)	0.80 (0.39–1.66)	0.73 (0.33–1.53)
Location of hospital (rural)		1.20 (1.11–1.30)	1.24 (1.07–1.44)	1.19 (1.06–1.33)	1.20 (0.92–1.56)
Overall *P*-value for model		<0.001	<0.001	<0.001	<0.001

[a]For the adjusted relative risk (RR) 1982–2000/01, each factor was adjusted for age, Box–Tidwell transformation of age, calendar period, Charlson index, indigenous status and marital status, and surgical status except where it was the factor of interest. The lung cancer models were also adjusted for gender and histology group.
[b]For the adjusted RR 1991–2000/01, each factor was adjusted as for footnote 'a', plus ARIA, IRSD, location and status of hospital, and insurance status except where it was the factor of interest.

outcomes has been published. Access to private hospitals was a significant determinant of survival. It is plausible that people with access to private health care presented with less-advanced lung cancer.[22] It is also plausible that women with breast cancer presenting to the private hospitals had less-advanced cancers, but there is no published evidence for this in Australia. With lung cancer, we saw an increased use of surgery in the private sector, which may also in part explain the improved survival. It is possible that patients entering the private sector may be more demanding of treatment than those in the public sector and these demand factors may push the clinician towards an increased use of surgery.[28] Different methods of surgeon remuneration in the private and public sectors may also offer a rational basis for differences in provider behaviour.[3] Many clinicians work in both the public and private sectors, suggesting that skills and knowledge are similar in both. Alternatively, there may be patient characteristics, such as better health or lifestyle choices, which

influence the outcome; for example, there is less comorbidity in less disadvantaged groups, leading to increased survival and fitness/desire for surgery, although we adjusted for comorbidity in our analysis.

Related to the ability to purchase private health care is socio-economic status. Australia-wide, there are reports that people in lower socio-economic groups have worse lung and breast cancer survival.[10] Although we found this to be true with breast cancer, it did not reach significance with lung cancer. In the USA, a number of studies have found socio-economic status to be a factor in lung cancer survival.[29] The indications from our study are that access to a private hospital may have more influence on lung cancer survival than socio-economic status, while for breast cancer both socio-economic status and private hospital access may be important.

The policy implications of these locational, socio-economic and private health care disparities on survival after lung and breast cancer are considerable in a country that overall has survival figures on a par, if not better, than other countries.[10–14]

For people in rural and remote areas a number of initiatives may assist in gaining improved survival outcomes, albeit that the wide dispersal of the population limits the solutions to those that are economically and professionally viable. If poor prognosis after a diagnosis of lung cancer in rural/remote populations is stage-related, it is imperative that patients are identified sooner; however, screening, even in high-risk populations, has not been shown to be beneficial.[24,30] Thus, educating the public to see a general practitioner (GP) sooner after lung cancer symptoms develop may be more beneficial, together with a continued emphasis on prevention with anti-smoking campaigns.[13] Raising awareness of GPs in rural/remote locations is also important, especially with regard to treatment options, as there is evidence of a degree of medical nihilism to patients with lung cancer.[28] The provision of better radiography facilities, such as PET (positron emission tomography) scanners, in rural areas may also assist in early diagnosis, staging, referral and treatment, although cost-effectiveness analyses to ensure appropriate resource usage would be required. Early fast referral to metropolitan centres of excellence, especially those with specialist surgeons/oncologists working with multidisciplinary teams, also seems essential.[5,9,28]

The state breast-screening programme already assists with the early diagnosis and referral of women with breast cancer.[26] Post-detection stage policies are required for women who are cared for in rural hospitals. These may include policies to ensure that adequate resources are available in rural hospitals in the form of ongoing educational programmes for rural surgeons, additional radiology and chemotherapy facilities and staffing of multidisciplinary teams. Increased continuity of care proposals are also needed to improve liaison between rural and metropolitan surgeons and oncologists.[27] The alternative is to send women to metropolitan centres for care where outcomes are better, possibly due in part to specialist surgeons.[11,12]

The side-by-side public/private system and its inherent problems are more difficult to resolve without major system change; the political will for this is not apparent in either the present government or the opposition.[4] Policies are therefore limited to ensuring that public patients have the same access to the public system as those accessing the private system. Inherent in these strategies is that treatment patterns are governed by the same evidence-based guidelines within both the public and the private systems. In the case of breast cancer, clinical practice guidelines are available,[31] whereas for lung cancer they are still under development. Clinical audits to ensure adherence to guidelines may also be helpful.[32]

Implementation of policies to redress social, economic and locational disadvantage will take time to filter through to improved survival outcomes for cancer patients. In the meantime we need to continue to use health services research methods to expose otherwise silent and unnoticed causal factors that lead to a poorer prognosis in disadvantaged groups.

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